

In summary it may be said:

1. That *Hendersonia occulta rubella* (Green) occurs, living, at Soldier's Grove, Crawford Co., Wisconsin.

2. That at this locality it is restricted to the region above the high water mark of the floodplains, and below the upland. Here it is most abundant just above the reach of flood waters, becoming less common as the uplands are approached.

Since nearly all the records of the occurrence of this species as a modern form are from the Driftless Area of southwestern Wisconsin, northeastern Iowa, and southeastern Minnesota and from the Appalachians, these two regions must be considered the regions of survival of the species.

Conversely, it is the author's belief that further search will show the species more or less uniformly distributed over the non-glaciated area mentioned.

For previous records of this species, see Shimek's paper (Proc. Davenport Acad. Sci. 9:173).

The specimens of *Hendersonia* described as having been collected at this locality are in the collection of the writer, with duplicates deposited in the museum of the Acad. of Nat. Sci. of Philadelphia, and in the museum of the University of Wisconsin (UW No. 4776), at Madison.

FACTORS IN THE EVOLUTION OF THE PROSOBRANCHIATE MOLLUSC, *THAIS LAPILLUS*

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The aim of this paper is not to set forth the degrees of evolution in the mollusc, *Thais lapillus*, but to call attention to an apparent process of this phenomenon, *viz.*, *variation*. Also, to indicate, at least, some of the environmental factors, probably responsible for the divergence and maintenance of the apparent physical conditions of these animals.

It is a known fact that *variation is*. But the question still remains: *How does variation take place and under what condition does it continue the most extensively?* An extensive, continuous evolution through variation would be enhanced the best under, or by an extensive, continuous variation. Do environmental conditions contribute to this? To answer this question one may point out the kinds of variation this species is undergoing and the general and specific environmental conditions to which it is subjected.

Collecting different species of gasteropod molluscs on the coast of Northern Norway, during the summer of 1920, it was noticed that the species, *Thais lapillus*, showed a great variety of difference in the nature of the shell in color, in the height, the greatest diameter, the least diameter, the spire, the sutures, the operculum, the slant of the apex, and the aperture formation. Some shells are thick and rough with small aperture; some are thick and smooth with a large aperture; some are rough, thick, and large with a long apex; some are thick, and rough with a short apex; other shells are thin and rough or smooth with a small or large aperture and with a long or short apex; still others are thin with uniform color, others with diversified color, still others are smooth with uniform or diversified color and of variable size.

Now, it should be borne in mind that the coast line of Norway is very famous for its abundantly diversified nature. It is broken up into bays and inlets, fjords and straits, islands, islets and skerries; it is sprinkled with towns, fishing villages, and fishingsteads; rivers, rivulets, and brooklets. Each of these provides a special home for the species, collectively they are lending a helping hand to the changing processes going on in the *Thais*. The winds, waves and weathers of the years are also adding their quotas towards changing the living conditions for this organism. The peculiar setting of each place offers a special harbour for various species that may serve as food for hungry young and old of the *Thais* population.

The thin-shelled individuals of *T. lapillus* occurred invariably in the sheltered places, although some of these also live under semi-exposed situations. Beneath the docks of fishing villages and fishing steads were the most favorable abodes for this variant. The diversified colored ones occurred the most abundantly both in number and in degrees of coloration beneath docks from which seepage of brine and sometimes urine was considerable. The thin-shelled snails occurred also here but were also present in sheltered and semi-sheltered places away from the docks. The most highly corrugated and thin-shelled variety occurred on rocks and piles under the docks of herring salteries, as for example, Indre Kvarøy and Sandnessjøen in Nordre- and Søndre Helgeland, respectively.

Large, thick-shelled individuals with relatively long apex occurred the most commonly in estuaries. The color of this variety tends to blend pretty well with the sub-stratum. The shell is smooth.

Large, rough-shelled individuals with a relatively long apex occurred in sheltered places where food was abundant, *e. g.*, *Balanus*, sheltered from the sun by sea-weeds and protected against the battering waves by pockets and crevices in the rocks. If loosened by a dashing wave a snail would drop into one of these pockets with a short distance to the field of food. The best natural habitat for *Thais* seemed to be in places where the circulation of the sea from the open fjord was pretty constant, bringing in the *Balanus* larvae during the season. But *circulation* and *food* and sea-weed shelter were only conditional; one additional factor might upset completely all these. That is, too precipitous rocks above deep waters (160 meters), had no *Thais*. Snail occurring here, from time to time (the adjacent territory on both sides was richly populated, the water being shallower) evidently would not be able to crawl back if dropped to the depth of 160 meters, more or less.

The rough, thick-shelled snail, with small aperture, occurred high on the rocks in the tension zones in semi-

brackish water, sometimes in small freshwater pools along the edge of high water, remaining out of the sea water apparently most of the time.

The average type occurred everywhere, near or below the low water mark.

In other words, *T. lapillus* has not only a wide range of adjustment capacity to environmental conditions, but this adjustment capacity is reflected in the physical appearance of the species.

That is, those that occur on rocks above salt water in the tension zone between salt- and freshwater, *e. g.*, between dry land and the sea, are thick shelled, rough (corrugated) with small aperture, and of moderate size.

Those that are found in fresh water pools above high water levels are sometimes thin shelled but of medium size.

Those that live on the rocky floor of estuaries (with plenty of food) are smooth shelled, and large, with grayish color.

Those that live under docks of herring salteries, subject to seepage from salty refuse are small, thin-shelled, corrugated, variable in color and plentiful in number.

Those that live on the outside of the docks in more moderate waters resemble the last named, but are larger.

Those that occur in the open straits where an abundance of food occurs are of variable size, shape, thickness, corrugation and color (although the coloration is moderate).

Finally, those that occur everywhere between the medium low-tide and below low-tide level are of all sizes, all forms and colors, but in all respects much more moderate than any of the types occurring in the other described situations.

It seems, therefore, then, that the environment is responsible for something. Does it foster eccentricities present in the germ plasma which by heredity are transmitted from generation to generation but which at times are subjugated sufficiently so as not to appear or to stand out so prominently as at other times?

Individuals of *Thais lapillus* accidentally segregated into

different physical and chemical environmental conditions radiate in different directions. As the species becomes adapted to different environmental conditions the physical variation is definitely manifested.

THE PELECYPODA OF THE COOS BAY REGION, OREGON

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Among the many works relating to the molluscs of the western coast of North America relatively few references are made to the molluscan fauna of Oregon. No comprehensive work on this group of animals has been published for this particular portion of the Pacific Coast. Since it has been suggested that this region is an intermediate zone between the better known faunal areas of Puget Sound and San Francisco Bay, it was thought that the accompanying list of bivalve molluscs might prove useful to persons interested in carrying on further taxonomic and ecological investigations.

The region selected for this preliminary report is an area around the entrance to Coos Bay—the mouth of Coos River. This selection was made firstly because of the fact that this region offered within a limited accessible area, a wide range of environmental conditions with a rich littoral fauna and flora; secondly because extensive jetty operations are affecting to some extent the physical features both within the bay and along adjacent beaches. These changes will in time probably bring about adjustments in the plant and animal life.

The following list is a record of the results of careful collecting for the summers of 1926 and 1927. While all of them cannot be found in any one location, most of the species can be found within one day since all the above mentioned habitats are within a radius of three miles from the mouth of the bay.